CLAIMS

1. An arrangement comprising:

first means for shifting energy received at a first wavelength and outputting said shifted energy at a second wavelength, said second wavelength resulting from a secondary process induced by a primary emission of energy at a third wavelength, said third wavelength resulting from a primary process generated from said first wavelength by said first means;

second means disposed in functional alignment with said first means for containing said primary emission and enhancing said secondary process thereby; and

third means for shifting energy received at said second wavelength and outputting said shifted energy at a fourth wavelength.

2. The invention of Claim 1 wherein said second means includes first and second reflective means.

3. The invention of Claim 2 wherein said first and second reflective means have high reflectivity at said third wavelength of the primary emission.

4. The invention of Claim 2 wherein said first reflective means has high reflectivity at said second wavelength of the secondary emission.

5. The invention of Claim 2 wherein said second reflective means is partially transmissive at said second wavelength with a predetermined reflectivity.

6. The invention of Claim 5 wherein said predetermined reflectivity is about fifty percent.

7. The invention of Claim 2 wherein said primary process generates an additional emission of energy at a fifth wavelength.

8. The invention of Claim 7 wherein said first and second reflective means have low reflectivity at said fifth wavelength.

9. The invention of Claim 2 wherein said secondary process generates an additional emission of energy at a sixth wavelength.

10. The invention of Claim 9 wherein said first and second reflective means have low reflectivity at said sixth wavelength.

11. The invention of Claim 2 wherein said first and second reflective means are first and second mirrors.

12. The invention of Claim 11 wherein said first mirror includes a first surface and a second surface.

13. The invention of Claim 12 wherein said first surface of said first mirror has greater than 99% transmission at said first wavelength; greater than 90% transmission at said fifth wavelength; and greater than 90% transmission at said sixth wavelength.

14. The invention of Claim 12 wherein said second surface of said first mirror has greater than 97% transmission at said first wavelength; greater than 99% reflection at said third wavelength; greater than 99% reflection at said second wavelength; greater than 90% transmission at said fifth wavelength; and greater than 90% transmission at said sixth wavelength.

15. The invention of Claim 11 wherein said second mirror includes a first surface and a second surface.

16. The invention of Claim 15 wherein said first surface of said second mirror has 98-99% reflection at said third wavelength; 50% reflection at said second wavelength; greater than 90% transmission at said fifth wavelength; and greater than 90% transmission at said sixth wavelength.

17. The invention of Claim 15 wherein said first surface of said second mirror has greater than 99% reflection at said first wavelength; greater than 97% transmission at said second wavelength; greater than 90% transmission at said fifth wavelength; and greater than 90% transmission at said sixth wavelength.

18. The invention of Claim 1 wherein said first means is a crystal.

19. The invention of Claim 18 wherein said crystal is X cut.

20. The invention of Claim 18 wherein said crystal is rubidium titanyl arsenate (RTA).

21. The invention of Claim 20 wherein said first wavelength is approximately 1.06 microns, said second wavelength is approximately 3.01 microns and said third wavelength is approximately 1.61 microns.

22. The invention of Claim 1 wherein said third means includes an optical parametric oscillator.

23. The invention of Claim 22 wherein said optical parametric oscillator includes a silver gallium selenide crystal.

24. The invention of Claim 1 wherein said fourth wavelength is in the range of 8 - 12 microns.

25. The invention of Claim 1 wherein said fourth wavelength is in the range of 4.0 – 4.8 microns.

26. A mechanism for outputting energy comprising:

a laser for generating energy at a first wavelength;

a first optical parametric oscillator for shifting the energy output by said laser to a second wavelength, said first optical parametric oscillator including:

a crystal adapted to shifting energy received from said laser at said first wavelength and outputting said shifted energy at said second wavelength, said second wavelength resulting from a secondary process induced by a primary emission of energy at a third wavelength, said third wavelength resulting from a primary process generated from said first wavelength by said crystal, and

a mechanism disposed in functional alignment with said crystal for containing said primary emission and enhancing said secondary process thereby; and

a second optical parametric oscillator for shifting the energy output by said first optical parametric oscillator to a fourth wavelength.

27. A system for outputting energy in the 8-12 μm region comprising:

a laser for generating energy at 1.06 μm;

a first optical parametric oscillator for shifting the energy output by said laser to 3.01 μm, said first optical parametric oscillator including:

an x-cut rubidium titanyl arsenate crystal adapted to shifting energy received from said laser at 1.06 μm and outputting said shifted

energy at 3.01 μm, said 3.01 μm wavelength resulting from a secondary process induced by a primary emission of energy at 1.61 μm, said 1.61 μm wavelength resulting from a primary process generated from said 1.06 μm wavelength by said crystal, and

a mechanism disposed in functional alignment with said crystal for containing said primary emission and enhancing said secondary process thereby; and

a second optical parametric oscillator for shifting the energy output by said first optical parametric oscillator to 8-12 microns, wherein said second optical parametric oscillator includes a silver gallium selenide crystal.

28. A method for efficiently generating energy at a desired fourth wavelength including the steps of:

generating energy at a first wavelength;

shifting said energy at said first wavelength and outputting said shifted energy at a second wavelength, said second wavelength resulting from a secondary process induced by a primary emission of energy at a third wavelength, said third wavelength resulting from a primary process generated from said first wavelength;

containing said primary emission and enhancing said secondary process thereby; and

shifting said energy at said second wavelength and outputting said shifted energy at a fourth wavelength.

29. A method for generating a secondary emission including the steps of:

applying a laser to a crystal to produce a primary emission, wherein said crystal is potassium titanyl arsenate, and

applying said primary emission to said crystal to produce a secondary emission.

30. A method for generating a secondary emission including the steps of:

applying a laser to a crystal to produce a primary emission, wherein said crystal is an isomorph of potassium titanyl arsenate, and

applying said primary emission to said crystal to produce a secondary emission.